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MATERNAL - INFANT INTERACTION IN INFANTS WITH COLIC

BY

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
IN
PSYCHOLOGY

UNIVERSITY OF RHODE ISLAND
1997

MASTER OF ARTS THESIS

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Abstract

The experience of having an infant with colic may affect early interactions between the mother and infant. The present study investigated infant - mother interaction in infants with colic, excessive crying, and non-colic controls and their mothers. The Colic Symptom Checklist was used to identify infants between 4-6 weeks of age with colic (N=18), excessive crying (N=9), and controls without crying problems (N=13). The subjects were healthy, full-term normal infants recruited through pediatric referral. There were no differences between the three groups of infants for infant medical or family demographic characteristics. Face-to-face interaction was used to describe the caregiver's behavior, affect and the extent to which they facilitate or disrupt the infant and to describe the infant's behavior and affect in the context of the interaction with the mother. The infants and their mothers were videotaped in Tronick's Face-to-Face and Still-Face Interaction Paradigm. Infant and maternal affective behaviors were coded using Tronick and Weinberg's scoring system. Kruskal-Wallis tests showed that the interactions of the infants without colic or crying problems were characterized with more engagement with the environment during the first two minutes ($p < .05$) and still face ($p < .05$). Also, maternal responses differed in infants with colic. The mothers of infants with colic engaged in more withdrawn behaviors during the first two minutes ($p < .05$) and the reunion episodes ($p < .05$). These findings may have implications for the later maternal child attachment relationship.

Acknowledgments

I would like to acknowledge Janet Kulberg, my major professor, for her time, support, and guidance. I would also like to thank the other members of my committee. Thank you Denise DeZolt, Al Berman, and Peggy McGrath for your continued support and assistance with this thesis. Thank you Barry Lester for the access to the data in addition to your insight and guidance.

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Maternal - Infant Interaction in Infants with Colic

Little is known about the relationship between a mother and infant in the presence of the common pediatric complaint of colic. This study attempts to explore this relationship and hopes to determine if colic is related to disturbances in the mother-child relationship. This would provide some justification for the need for follow-up research to further explore the residual effects colic may have upon later parenting behavior.

After more than eighty years of research, the understanding of infant colic is poor, with little known about the etiology, pathophysiology or sequelae of this condition (Carey, 1984). Although there is controversy as to how colic is defined, there seems to be some consensus that colic occurs in otherwise healthy and well-fed infants between approximately one and four months of age and is often equated with excessive crying (Carey, 1984). The lack of a standard definition makes it difficult to determine the incidence of colic. The reports in the literature range from 8 to 40% (Lester, Boukydis, Garcia- Coll, & Hole, 1990). Weissbluth (1984) reports that colic affects over 700,000 infants and their families in the United States each year. There seems to be some agreement that colic is inconsolable crying for which there is no known physiological cause, lasting more than three hours a day, occurring at least three days a week and continuing for at least three weeks (Wessel, Cobb, Jackson, Harris, & Detweiler, 1954). Lester et al. (1990) expanded this "rule of 3" definition to include four clinical signs that describe the colic episode: (1) sudden onset, (2) qualitative changes in the cry sound, (3) physical signs associated with hypertonia, and (4) inconsolability.

There are many theories in the literature, about the etiology of this condition, but little firm evidence exists as to the true causes. There are also many contradictory findings in the literature. Illingworth (1985) made a distinction between intrinsic and extrinsic causes of colic.

Intrinsic causes

Gastrointestinal allergies are one suspected cause of colic. It is thought that an allergy or an intolerance to cow's milk protein is the cause of infantile colic. Research by Lothe and Lindberg (1989) concluded that cow's milk seems to be the major cause of colic in formula-fed infants. They found that colic symptoms disappeared when infants were given a cow's milk-free diet. This study also included a double blind crossover design that found that when the bovine whey protein was reintroduced it resulted in reoccurrence of colic. Harris, Petts, and Penny (1977) also substantiated the claim that colic can be due to cow's milk allergy. They supported this claim by taking bowel biopsies of the infants while on cow's milk formula and soy formula. Although this rather invasive procedure isn't commonly done because of obvious reasons, this study is one of the first to examine immunological mechanisms at work. There also have been studies done in which the effects of cow's milk allergies were conducted on breast fed infants (Jakobsson & Lindberg, 1983). When the mothers were put on a diet free of cow's milk, their infants' colic disappeared which suggests that the first step for breast feeding mothers in relieving colic is to eliminate cow's milk from their diet. Carey (1984) claims that these studies are extremely encumbered with methodological problems and the findings are therefore inconclusive.

Another highly suspected cause of colic is the newborn's digestive system. There are many components to this proposed cause. One reason is thought to be intestinal spasms, since colicky babies tend to draw their legs up, seemingly in excruciating pain. This supposed visceral pain arises from noxious stimuli and is often cramping in nature (Geertsma & Hyams, 1989). It is associated with autonomic symptoms such as sweating and restlessness. Another reason is thought to be trapped gas because virtually all parents report that their babies pass a great deal of gas during one of their crying spells. When dietary carbohydrate is not completely absorbed by the small intestine, it passes into the colon where it is fermented by colonic bacteria. This process results in the evolution of several gases where approximately 15% are absorbed into the bloodstream and the remainder are passed as flatus (Geertsma & Hyams, 1989).

Another reason suggests that colic is due to immature peristalsis which is the rhythmic squeezing and pumping that the intestine undergoes as the digesting food moves along which in turn would put the infant in a constant state of indigestion. While these explanations are plausible, there is very little research evidence supporting the newborn's digestive system as a possible cause of colic.

Another interesting factor may be the infant's intrinsic temperament. It is logical to assume that a colicky baby has a difficult temperament and will be a difficult older child. Some attempts have been made to support this relationship. Carey (1972) attempted to correlate scores on his temperament scale with the condition of colic. He showed a high correlation between colic as documented by office records and difficult temperament as recorded by parental assessments at 4 and 8 months. However, these results should be viewed with caution because of potential parental bias. Lester et al.

(1990) found that mothers of infants with colic rated their infants as more fussy/difficult on a self report measure of temperament than mothers of non-colicky infants. Since there is very little research regarding the possible relationship between temperament and colic, it would be important to include a measure of temperament in future studies.

Extrinsic causes.

The technique of feeding is commonly cited as the cause of colic or excessive crying in the infant. The possibilities are that the infant has been over or underfed, has taken in excessive amounts of air, or has not been adequately burped (Birdson, 1975).

Another commonly held view is that colic is caused by maternal psychological problems such as anxiety or personality factors. Carey (1984) noted an association between maternal anxiety and colic. However, this perspective originated from episodic clinical observations and case studies (Geertsma & Hyams, 1989).

Taubman (1984) theorized that colic results from inappropriate parental responses to the baby's crying and maternal misinterpretation of the cries. His treatment consisted of counseling the parent on more effective responses. He essentially gave them a rigid set of instructions of what to do whenever their infants cried. He reported a significant decrease in total crying. In a later study, Taubman (1988) compared parental counseling with the elimination of cow's milk formula. Parental counseling in addition to the formula change decreased the crying, yet the counseling decreased the crying quicker and to a greater degree than the soy formula. This study supported his earlier findings suggesting once again that colic is the result of parental misinterpretation not gastrointestinal allergies.

Among the substantial disagreements and varying research, there is general agreement that the term colic is ambiguous, vague, and loosely applied by parents and clinicians (Carey, 1984). Colic is interesting because it is not associated with known mortality or obvious morbidity. It is a condition that is thought of as transitory or self-limiting. Consequently, long-term follow up studies have not been conducted. However, the problem isn't limited to just the baby.

Infant irritability is an influential condition in the relationship between mother and child in the first year of life (van den Boom, 1994). This condition can also be thought to impact upon maternal perceptions, personality factors, caregiving abilities, and involvement. Mothers of infants with colic perceive their infants to be more bothersome, withdrawing, intense, and negative in mood (Sloman, Bellinger, & Krentzel, 1990). In fact, mothers who reported higher levels of crying in their infants also perceived a lack of positive reinforcement and sense of competence from the parent child relationship (Beebe, Casey, & Pinto-Martin, 1993).

Mothers of infants with excessive/extreme crying have been reported as depressed (Brazelton, 1962), exhausted (Jones, 1985), and angry (Waldman & Sarsgard, 1983). Brazelton (1990) asserts that colic is exacerbated by maternal anxiety, while Humphry and Hock (1989) report that mothers of infants with colic indicate greater levels of anxiety about leaving their infants for a short period of time. Mothers also report higher levels of stress associated with their infants crying (Humphry & Hock, 1989). However, these studies do not discuss the mother's behaviors toward her colicky infant.

There has been some research that addresses the effects of colic or irritability on parenting. Crockenberg and Smith (1982) assert that early research has provided some

support for the fact that early infant irritability is associated with maladaptive patterns of caretaking, among which are withdrawal, hostility, and unresponsiveness. Also, mothers of infants with excessive or extreme crying provide fewer positive responses to their baby (Shaver, 1979). Sloman et al. (1990) looked at colicky infants' subsequent performance on a developmental assessment. Six month old infants with colic scored significantly lower than same aged infants without colic on both the Mental and Psychomotor scales of the Bayley Scales of Infant Development. However, there was no effect on performance at 12, 18, and 24 months of age. The authors attribute this temporary delay in development to less favorable patterns of caregiving.

Colic can also affect the level of involvement a mother has with her infant. It was also found that a heightened level of irritability was associated with lower maternal involvement (van den Boom, 1994). Sloman et al. (1990) found that infants with colic received less stimulation from their mothers than infants without colic.

Given the above research, it may seem logical to conclude that crying, specifically colic, in infancy, may impede upon the later parent child relationship. There are a variety of ways in which this may occur, but the most plausible explanation seems to be the transactional model (Sameroff & Chandler, 1975). The transactional model holds that the child is an active participant in the construction of his environment. The child's environment does not happen independent of the child, but rather the child's behavior is largely a function of the transactions between the child and his environment over time. Colic is a problem that has to do with extreme crying that may be biologically based, thus resulting in psychological stress in the mother which in turn alters her behavior toward the infant. The changing maternal responses which affect the infant's behavior, would

seem to affect the developing parent-infant relationship. Therefore, even after the colic stops, the mere presence of this condition could potentially result in a disturbance in the mother-child relationship. However, what is not available in the literature is a direct observational study of maternal-infant interaction in infants with colic.

The present study attempts to link colic with a disturbance in maternal-infant interactions. If such a disturbance is found, it may provide some justification for the need for follow-up research to further explore the residual effects colic may have upon the mother-infant relationship. In addition, there have been relatively few studies that examine the stability of the behavior in the parent-child interaction across the first few years of life. One rationale for this is that different constructs and paradigms are typically used at the different / older ages, for example, face-to-face interactions in early infancy and attachment during late infancy (Field, Vega-Lahr, Goldstein, & Scafidi, 1987).

Since there has not been extensive research on mother-infant interactions in infants with colic and no recent studies that measured interaction via direct observation, the purpose of this study is to examine mother-infant interaction in the context of a face-to-face interactional assessment. The Face-to-Face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978) has been used extensively by researchers interested in the characteristics of both normal and compromised mother-infant interactions. Tronick et al. (1978) used the paradigm to illustrate infant sensitivity to changes in maternal behavior following normal interactive behavior. They discovered that when mothers made their face still or emotionless, infant attention and smiling decreased. Essentially, the purpose of the face-to-face observations are to describe the caregiver's behavior and affect and the extent to which these facilitate or disrupt the infant; and to describe the

infants' behavior and affect in the context of the mothers' behavior and affect (Tronick & Cohn, 1989). The paradigm confronts the infant with an age-appropriate developmental task, an age-appropriate stress, a reunion episode, and a face-to-face social interaction with a stranger. Infant and mother behavioral summary scores are obtained.

Other-directed and self-directed regulatory behaviors are part of a normal infant's repertoire for coping with extreme emotions. These coping behaviors make it possible for the infant to control his/her emotional state while interacting with people or on the inanimate world. Tronick and Cohn (1989) suggested that during the still-face period, infants are responding to a violation of their expectations of reciprocal adult behavior. During the interaction both the infant and the mother are engaging in goal-directed exchanges, through a mutually regulated system. Some of the most dramatic effects of regulatory behaviors on infant emotions are seen when the mother's behavior is manipulated so that the infant is prevented from successfully achieving the goal for reciprocal interaction. An example of this would be to distort the mother's affective behavior, such as having her remain still faced when looking at her infant. In turn, the infant will signal to the mother through vocalizations and gestures, in an attempt to get the mother to change her behavior. Essentially, infants modify their affective displays and behaviors on the basis of their appreciation of their mothers' affective displays of behavior (Lester, Hoffman, & Brazelton, 1985). Research using the Face-to-Face paradigm has shown that six month old infants decrease smiling and gazing at their mothers and grimace more during the still-face episode (Gusella, Muir, & Tronick, 1988). Cohn and Tronick (1987) found that maternal positive expression precedes the onset of

the infant's positive expression. Also, when the infant becomes positive the mother will remain positive until the infant becomes disengaged.

In light of limited research dealing with mother-infant interactions in the presence of colic and relatively no long term follow up data to suggest that there may be an impairment in the relationship, this study attempts to examine the mother-infant relationship in the early months when there is the presence of colic. The general questions that guided this study are: a) Do infants with colic react differently with their mothers than infants without colic? and b) Do the mothers of colicky infants interact differently with their infants than mothers with infants without crying problems? Essentially, the purpose of this study is to determine if the mother-infant relationship is affected in the presence of colic. The hypotheses of the study are a) Colicky infants are more likely to react to their mothers with negative engagement and b) Mothers of colicky infants interact with their infants with either hostile or withdrawn engagement.

Method

Participants

Fifty infants between one and three months of age participated in a study at Women and Infants' Hospital supported by Ross Laboratories. The focus of this larger study was to determine if an experimental formula will relieve colic in one to three month old infants. The experimental formula consisted of Isomil formula in addition to fiber. The rationale was that the fiber would relieve the gastrointestinal distress. All subjects were healthy, full term (> 37 weeks gestational age) infants. The birthweight for all of the

infants was greater than 2500 grams. Most families were middle to upper middle class and referred to the study through their pediatricians. The subjects did not differ on medical or family demographic characteristics. Eight infants were not included in the present analyses because they did not complete the face-to-face paradigm because they were either asleep and/or the mother requested to end the lab session. Two additional infants were also not included in these analyses because the mother did not accompany them to the visit, therefore another caregiver completed the face-to-face interaction.

The remaining forty subjects were assigned into one of three groups: colic(n=18), excessive crying(n=9), and control(n=13). These subjects also did not differ across the three groups on medical or family demographic characteristics. The demographics for this sample are reported in Table 1.

Table 1
Demographics of sample for colic, control, and excessive cry groups.

	Colic		Control		Cry	
Gender	M	F	M	F	M	F
	9	9	9	4	3	6
Apgar 5min	9.1(0.1)		8.9(0.1)		8.9(0.2)	
Gestational Age	39.0(0.4)		39.3(0.6)		39.3(0.5)	
Birth Weight (lb.)	6.0 (0.3)		7.4 (0.3)		6.3 (0.2)	
Birth Length(in.)	19.7(0.2)		20.3(0.3)		19.7(0.3)	
Birth Head Circumference	34.9 (1.4)		35.0 (0.4)		33.6 (0.7)	
Entry Age of Mom (years)	29.9 (22-37)		30.2 (24-39)		31.1 (23-38)	
Parity	2.1(1-5)		2 (1-4)		2 (1-3)	

Colic was determined by the Colic Symptom Checklist developed by Lester, et al. (1990). First the infant had to meet the rule of 3 criteria for excessive crying (Wessell, et. al., 1954) and in addition had to exhibit at least two of the following characteristics: (1) sudden onset, (2) qualitative changes in the cry sound, (3) physical signs associated with hypertonia, and (4) inconsolability. Subjects were assigned to the excessive crying group if they met the “rule of 3” criteria but did not have two of the above symptoms from the colic symptom checklist. Subjects were assigned to the control, non crying group if they did not meet the “rule of 3” criteria.

Procedure

Laboratory Visits. In the larger study the mother-infant dyads came into the lab a total of 6 times. At first they went home with a different formula each week and daily behavior diaries were kept. In the present study, only the very first lab visit that the subjects participated in was used. This was to control for the possible effects of the formula change as well as the unmeasurable effect of the study and experimenters. Essentially, this attempts to look at the presenting problem (colic) without the aforementioned unmeasurable variables confounding the results. The initial part of the visit involved feeding the infant while obtaining heart rate, vagal tone, respiration rate, and electrogastrograms (EGG). Mothers completed a series of questionnaires and the face-to-face interaction assessment was performed.

Face-to-Face Interaction. This paradigm confronts the infant with an age-appropriate developmental task (face-to-face social interaction with the mother - play). This involves the mother talking to her infant although not touching him for two minutes.

Then she is instructed to turn her back to the infant to break the interaction. Next, the infant is confronted with an age-appropriate stress in which the mother returns to the infant with a still or poker face for two minutes. She is not to talk or smile to the baby. She once again turns her back and then returns for reunion episode in which she is to talk to the infant as she did in the first portion. Here, the mother and infant must renegotiate the interaction after it has been stressed. Next, the examiner comes in and talks to the baby for two minutes. Since this portion leads into a laboratory assessment of temperament, it will not be looked at. This interaction is videotaped using two cameras and a split screen generator. This essentially puts both the picture of the mom and the baby on the same screen.

Data Reduction. Infant and mother behaviors were coded by this researcher, blind to group status, using the Infant and Caregiver Engagement Phases coding scheme developed by Tronick and Weinberg (1992). Reliability on the coding scheme was established and maintained using a sample of 15 mother-infant pairs. Inter-rater reliability was determined using the percent agreement criterion of greater than 85%. The infant engagement variables are negative engagement, protest, withdrawn, social monitor, object/environment engagement, and social positive engagement. These behaviors are coded for each of the episodes in the face-to-face paradigm. The mother engagement variables are negative engagement, hostile, withdrawn, social monitor, neutral positive engagement, social positive engagement, exaggerated positive engagement. These behaviors were only coded for the initial play episode and the reunion episode. Each of the above behaviors are mutually exclusive. Essentially, it is understood that when one behavior ends another behavior begins. Summaries of the

duration of time spent in each behavior per each episode were calculated for both the infant and the mother. Since the amount of time the infant and or mother spent in each of the episodes varied by dyad, the proportion of time that each mother and infant engaged in above behaviors for play, still-face, and reunion episodes were calculated.

Results

It was hypothesized that there would be significant differences in the amount of time that the infants with colic spent engaging in negative behaviors during each of the three episodes. Also, this researcher anticipated that mothers of colicky infants would engage in more negative behavior such as hostile or withdrawn engagement during the first two minutes and the reunion episode.

A power analysis was conducted to illustrate the magnitude of the effect that could have been detected given the small sample size of this study. The power analysis yielded a value of .47. According to Cohen (1988), a value of .80 is desired and therefore, this study would need approximately 40 more subjects to achieve this desired level of power. Implications of this will be discussed later.

Infants

The means and standard deviations for each of the infant behavior variables for each episode are reported in Table 2.

Table 2

Means and standard deviations of six infant behavior variables for each of three episodes for colic, control, and excessive crying groups.

	Colic	Control	Cry
<u>PLAY EPISODE</u>			
negative engagement	1.44 (2.62)	3.15 (7.67)	3.11 (4.62)
protest engagement	10.17 (20.86)	4.08 (11.79)	5.11 (15.33)
withdrawn engagement	0	0	0
social monitor engagement	43.39 (40.81)	31.46 (31.19)	46.67 (45.20)
obj/environment engagement	28.33 (35.32)	66.69 (40.34)	34.89 (40.85)
positive engagement	2.78 (5.17)	4.62 (7.27)	3.11 (8.61)
<u>STILL FACE EPISODE</u>			
negative engagement	6.11 (14.23)	4.23 (7.80)	1.44 (2.60)
protest engagement	4.06 (10.52)	0	11.78 (27.77)
withdrawn engagement	0	1.77 (6.38)	.22 (.67)
social monitor engagement	23.33 (30.5)	24.54 (36.82)	46.89 (45.94)
obj/environment engagement	46.22 (36.82)	67.08 (47.33)	31.11 (26.03)
positive engagement	.11 (.32)	.92 (2.78)	0
<u>REUNION EPISODE</u>			
negative engagement	6.44 (13.67)	3.54 (7.37)	2.88 (5.21)
protest engagement	11.44 (20.79)	0	15.56 (31.27)
withdrawn engagement	.33 (1.41)	0	.33 (1.00)
social monitor engagement	37.89 (38.50)	38.15 (34.23)	43.33 (42.62)
obj/environment engagement	26.28 (29.71)	54.85 (38.33)	30.11 (36.32)
positive engagement	1.39 (3.35)	3.46 (6.20)	2.67 (5.50)

Since the data were not normally distributed, non parametric Kruskal-Wallis Tests were conducted to determine if there were any differences among the three groups on any of the six infant behavior variables. The Kruskal-Wallis technique determines if k independent samples are from different populations (Siegel & Castellan, 1988).

First Play Episode. The infants in the control group spent more time engaging in the environment than the infants in either the colic or excessive crying groups, (Chi square=6.42, $p < .05$).

Still Face. The infants in the control group spent more time than the infants in the excessive crying group engaging in the environment, (Chi square=5.78, $p < .05$).

Mothers

The means and standard deviations for each of the mother behavior variables for each episode are reported in Table 3.

Table 3

Means and standard deviations of seven mother behavior variables for each episode for colic, control, and excessive crying groups.

	Colic	Control	Cry
<u>PLAY</u>			
negative engagement	.39 (1.42)	0	0
hostile engagement	.17 (.71)	0	0
withdrawn engagement	6 (12.49)	0	0
neutral engagement	30.67 (29.60)	39.08 (35.74)	46.33 (18.41)
neutral/positive engagement	30.28 (30.53)	22.84 (26.38)	28.77 (29.10)
exaggerated pos engagement	1.11 (2.56)	.54 (.88)	.11 (.33)
positive engagement	34.28 (36.04)	51.62 (34.48)	23.56 (19.52)
<u>REUNION</u>			
negative engagement	0	.54 (1.94)	1.33 (2.69)
hostile engagement	0	0	0
withdrawn engagement	6.28(12.86)	0	0
neutral engagement	28.28 (27.17)	42.69 (40.46)	46.88 (20.01)
neutral/positive engagement	21.39 (30.27)	19.15 (20.33)	27.11 (22.67)
exaggerated pos engagement	1.56 (3.31)	.85 (1.46)	.22 (.67)
positive engagement	26.39 (41.79)	42.77 (34.01)	26.0 (25.96)

Since the data were not normally distributed, non parametric Kruskal-Wallis Tests were conducted to determine if there were any differences among the three groups on any of the seven mother behavior variables.

First Play Episode. The mothers of infants with colic spent more time than the mothers of infants in either the control or excessive crying groups engaging in withdrawn behavior, (Chi square=6.77, $p < .05$).

Reunion Episode. The mothers of infants with colic spent more time than the mothers of infants in either the control or excessive crying groups engaging in withdrawn behavior, (Chi square=7.33, $p < .05$).

Discussion

This study compared the interactions between mother and infant in infants with colic, excessive crying, and without crying problems. One of the major questions that guided this research was if colic was related to disturbances in the maternal child interactions. Specifically, do mothers of infants with colic interact differently with their infants. Also, we hypothesized that infants with colic would also interact differently with their mothers. The latter hypothesis was not illustrated in this study. Infants with colic did not interact with their mothers with more negative engagement. Overall, infants in the colic and excessive crying groups displayed more negative behaviors than the infants without crying problems, but not to a statistically significant degree. This is not to equate colic and excessive crying, rather this result can be explained by the nature of the Face to Face paradigm. It has been shown that normal infants become less positive and more negative during the still face and reunion episodes as compared to the play period preceding the still face (Tronick, et al., 1978; Cohn & Tronick, 1983; Field, 1984). Hence, it is logical to assume that most of the infants would have some negative reactions to this procedure. It is noteworthy however, to mention that the infants in the control group did not display any protest behaviors during the still face and reunion episodes. These infants also spent significantly more time engaging in the environment in the play

and still face episodes than the colic and excessive crying infants. One thought is that infants without crying problems may not need their mother as a source of support and thus are not as stressed from the still face episode. It is interesting that theoretically they should be distressed and they are not. Something different in the maternal child relationship may be happening here. This may have some implications for attachment, however. The few studies that examined later attachment behavior in addition to early face-to-face behavior show that infants who tried via positive expressions to elicit a response from their mothers during the still face episode were more likely to be classified as securely attached at 12 months (Tronick, Ricks, & Cohn, 1982; Cohn, Campbell, & Ross, 1991).

The hypothesis, that the mothers of infants with colic would interact with more negative engagement, was confirmed. Mothers of colicky infants spent significantly more time in withdrawn engagement behavior than the mothers of excessive crying and control infants during both the initial play and reunion episodes. In fact, none of the mothers in the control group dyad or the excessive cry group dyad showed any withdrawn behaviors. Also, none of these mothers showed any negative engagement during the initial play episode. These results should not be interpreted in the sense that colic is "caused" by the mother. Rather, it could be explained from a transactional perspective (Sameroff & Chandler, 1975). The transactional perspective views the child as a product of a continuous dynamic interaction between the child and the experience provided by his or her family and social context. Experiences provided by the environment are not seen as being independent of the child. The child may also have been a strong determinant of current experiences. Using this perspective in terms of the current study, it is possible

that a condition that resides in the infant (colic) changes how the mother responds to the infant. Next, the mother's behavior toward her crying infant in turn affects the infant's behavior and may have longer term implications for the maternal child relationship (Lester, et al., 1990). If colic is to be seen as a true transactional event then the mother has to be behaving in a way that she ordinarily would not. This current study did not address this factor. In the future, it may be helpful to include an instrument measuring maternal perceptions about caregiving or nurturance.

It has been established that infant irritability is an influential condition in the relationship between a mother and child in the first year of life (van den Boom, 1994) leading to negative perceptions of the infant as well as lowered maternal involvement and sensitivity. These conclusions may account for the fact that in this study mothers of infants with colic interacted with more withdrawn behavior. If we can associate lower maternal involvement and stimulation to withdrawn behavior, then it does seem plausible that colic has interfered with the maternal child relationship. Further investigation of levels of maternal sensitivity and involvement should be included in later studies. What is interesting in this study is that only the mothers of infants with colic behaved with negative engagement. It leads to the question of what is the experience of being a mother of an infant with colic.

There have been relatively few studies that examine colic's long term effects upon the developing child because it has been assumed that colic is a short term problem. In one study, infants with problems with feeding and crying behavior during early infancy had more behavior problems at three and a half years of age and were regarded as more vulnerable by their parents (Forsythe & Canny, 1991). Families with infants with colic

also experience more interactional problems later on (Rautava, Lehtonen, Helenius, & Sillanpaa, 1995). Future research should include long term follow up to investigate the residual effects that colic has had upon the child, family, and interactional and attachment relationships.

Sensitive responsiveness in mothers has been found to be causally related to secure attachment in infants (van den Boom, 1994). One of the assumptions of attachment theory is that the security of the attachment relationship is in large part determined by the quality of interactions mothers and infants experience over the first year of the infant's life (Ainsworth, Blehar, Waters, & Wall, 1978). It seems logical to include measures of attachment in future long term follow up studies as well as infant responsiveness in the context of interaction and attachment.

In conclusion, mothers of infants with colic do interact differently with their infants. Here, we demonstrated that colic is indeed impacting upon maternal child interactions. It is suggested however, that this study be replicated with a larger and more representative sample also taking into consideration some of the above stated suggestions. It also has been stated that the laboratory situation may not be representative enough of the interactions between mothers and infants (Field & Ignatoff, 1981). Therefore, future studies may need to include a more natural observation of mother child interactions.

Bibliography

Ainsworth, M., Blehar, M., Waters, E., & Wall, S. (1978). Patterns of attachment: A psychological study of the strange situation. Hillsdale, NJ: Erlbaum.

Beebe, S., Casey, R., & Pinto-Martin, J. (1993). Association of reported infant crying and maternal parenting stress. Clinical Pediatrics, 32, 15-19.

Birdson, M. (1975). Infantile colic. In H.C. Shirkey (Ed.), Pediatric therapy (5th ed., pp. 617-619). St. Louis: Mosby.

Brazelton, T. (1962). Crying in infancy. Pediatrics, 29, 579-588.

Brazelton, T. (1990). Crying and colic. Infant Mental Health Journal, 11, 349-356.

Carey, W. (1972). Clinical applications of infant temperament measurements. Journal of Pediatrics, 81, 823-828.

Carey, W. (1984). "Colic" - primary excessive crying as an infant environment interaction. Pediatric Clinics of North America, 31, 993-1005.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohn, J., Campbell, S., & Ross, S. (1991). Infant response in the still face paradigm at 6 months predicts avoidant and secure attachment at 12 months. Development and Psychopathology, 3, 367-376.

Cohn, J., & Tronick, E. (1983). Three month old infants' reaction to simulated maternal depression. Child Development, 54, 185-193.

Cohn, J., & Tronick, E. (1987). Mother-infant face-to-face interaction: The sequence of dyadic states at 3, 6, and 9 months. Developmental Psychology, 23, 68-77.

Crockenberg, S., & Smith, P. (1982). Antecedents of mother-infant interaction and infant irritability in the first three months of life. Infant Behavior and Development, 5, 105-119.

Field, T. (1984). Early interactions between infants and their postpartum depressed mothers. Infant Behavior and Development, 7, 517-522.

Field, T. & Ignatoff, E. (1981). Videotaping effects on the behaviors of low income mothers and their infants during floor play interactions. Journal of Applied Developmental Psychology, 2, 227-236.

Field, T., Vega-Lahr, N., Goldstein, S., & Scafidi, F. (1987). Face-to-face interaction behavior across early infancy. Infant Behavior and Development, 10, 111-116.

Forsyth, B. & Canny, P. (1991). Perceptions of vulnerability three and a half years after problems of feeding and crying behavior in early infancy. Pediatrics, 88, 757-763.

Geertsma, M., & Hyams, M. (1989). Colic - A pain syndrome of infancy?. Pediatric clinics of North America, 36, 905-919.

Gusella, J., Muir, D., & Tronick, E. (1988). The effect of manipulating maternal behavior during an interaction on three and six month olds' affect and attention. Child Development, 59, 1111-1124.

Harris, M.J., Petts, M., & Penny, R. (1977). Cow's milk allergy as a cause of infantile colic: Immunofluorescent studies on jejunal mucosa. Australian Paediatric Journal, 13, 276-281.

Humphry, R., & Hock, E. (1989). Infants with colic: A study of maternal stress and anxiety. Infant Mental Health Journal, 10, 263-272.

Illingworth, R. (1985). Infantile colic revisited. Archives of Disease in Childhood, 56, 407.

Jakobsson, I., & Lindberg, T. (1983). Cow's milk proteins cause infantile colic in breast fed infants: A double blind crossover study. Pediatrics, 71, 268-271.

Jones, J.A. (1985). Can fussy babies be spoiled? Pediatrics, 76, 854-855.

Lee, C. & Bates, J. (1985). Mother-child interaction at age two years and perceived difficult temperament. Child Development, 56, 1314-1325.

Lester, B. (1987). A biosocial model of infant crying. In L. Lipsitt & C. Rovee-Collier (Eds.), Advances in infant research. New Jersey: Ablex.

Lester, B., Boukydis, C., Garcia Coll, C., & Hole, W. (1990) Colic for developmentalists. Infant Mental Health Journal, 11, 321-333.

Lester, B., Hoffman, J., & Brazelton, T.B. (1985). The structure of maternal infant interaction in term and preterm infants. Child Development, 56, 15-27.

Lester, B., & Zeskind, P. (1982). A biobehavioral perspective on crying in infancy. In H. Fitzgerald, B. Lester, & M. Yogman (Eds.), Theory and research in behavioral pediatrics (Vol. 1). New York: Plenum Press.

Lothe, L., & Lindberg, T. (1989). Cow's milk whey protein elicits symptoms of infantile colic in colicky formula fed infants: A double blind crossover study. Pediatrics, 83, 262-266.

Rautava, P., Lehtonen, L., Helenius, H., & Sillanpaa, M. (1995). Infantile colic: Child and family three years later. Pediatrics, 96, 43-47.

Sameroff, A. & Chandler, M. (1975). Reproductive risk and the continuum of caretaking casualty. In F.D. Horowitz, E.M. Hetherington, S. Scarr-Salapatek, & G.M. Siegel (Eds.), Review of child development research (Vol. 4, pp. 187-244). Chicago: University of Chicago Press.

Siegel, S. & Castellan, N. (1988). Nonparametric statistics for the behavioral sciences (2nd ed.). New York: McGraw Hill.

Shaver, B. (1979). Maternal personality and early adaptation as related to infantile colic. In P. Sherelefsky & L. J. Yarrow (Eds.), Psychological aspects of a first pregnancy and early postnatal adaptation (pp. 209-215). New York: Raven Press.

Sloman, J., Bellinger, D., & Krentzel, C. (1990). Infantile colic and transient developmental lag in the first year of life. Child Psychiatry and Human Development, 21, 25-36.

Taubman, B. (1984). Clinical trial of the treatment of colic by modification of parent - infant interaction. Pediatrics, 74, 998-1003.

Taubman, B. (1988). Parental counseling compared with elimination of cow's milk or soy milk protein for the treatment of infant colic syndrome: A randomized trial. Pediatrics, 81, 756-761.

Tronick, E., Als, H., Adamson, L., Wise, S., & Brazelton, T. (1978). The infant's response to entrapment between contradictory messages in face to face interaction. Journal of the American Academy of Child Psychiatry, 17, 1-13.

Tronick, E. & Cohn, J. (1989). Infant mother face to face interaction: Age and gender differences in coordination and the occurrence of miscoordination. Child Development, 60, 85-92.

Tronick, E., Ricks, M., & Cohn, J. (1982). Maternal and infant affective exchange: Patterns of adaptation. In T. Field & A. Fogel (Eds.), Emotion and early interaction (pp. 83-100). Hillsdale, NJ: Erlbaum.

Tronick, E. & Weinberg, M. (1992). Manual for the face-to-face still-face paradigm for the NICHD-NIDA NICU network neurobehavioral battery.

van den Boom, D. (1994). The influence of temperament and mothering on attachment and exploration: An experimental manipulation of sensitive responsiveness among lower class mothers with irritable infants. Child Development, 65, 1457-1477.

Waldman, W. & Sarsgard, E. (1983). Helping parents to cope with colic. Pediatric Basics, 33, 12-14.

Weissbluth, M. (1984). Crybabies: Coping with colic. New York: Berkley Books.

Wessel, M., Cobb, S., Jackson, E., Harris, G., & Detweiler, A. (1954). Paroxysmal fussing in infancy: Sometimes called colic. Pediatrics, 14, 421-434.